MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Mail Stop 2321
Gaithersburg, Maryland 20899

SRM Number: 1982
MSDS Number: 1982
SRM Name: Zirconia Thermal Spray Powder - Particle Size Distribution
Date of Issue: 22 October 2003

MSDS Coordinator: Mario Cellarosi
Phone: (301) 975-6776
ChemTrec: 1-800-424-9300

FAX: (301) 926-4751
E-mail: SRMMSDS@nist.gov

SECTION I. MATERIAL IDENTIFICATION

Material Name: Zirconia Thermal Spray Powder – Particle Size Distribution

Description: Each unit of SRM 1982 consists of a single bottle containing approximately 10 g of yttria stabilized zirconia (YSZ) powder.

Other Designations: Yttria Stabilized Zirconia (YSZ)

Chemical Name	Chemical Formula	CAS Registry Number
Zirconium Oxide	ZrO_2	1314 -23-4
Yttrium Oxide	Y_2O_3	1314 -36-9

DOT Classification: No classification assigned.

Manufacturer/Supplier: Metallurgical Technologies, Inc[1].

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Component	Nominal Concentration %	Exposure Limits and Toxicity Data
Zirconium Oxide	93	OSHA TWA: 5 mg/m^3
		NIOSH TWA: 5mg/m^3 (10 hours)
Yttrium Oxide	7	OSHA TWA: 1 mg/m^3
		NIOSH TWA: 1mg/m^3 (10 hours)

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Yttria Stabilized Zirconia
Appearance: fine sand; no odor
Relative Molecular Mass: not applicable
Specific Gravity (H_2O = 1)**:** 5.8
Vapor Pressure: not applicable
Solubility in Water: insoluble
Solvent Solubility: not applicable

[1] Identification of certain commercial materials in this MSDS does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials are necessarily the best available for the purpose.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point: Not applicable **Method Used:** Not applicable **Autoignition Temperature:** Not applicable

Flammability Limits in Air (Volume %): **UPPER:** Not applicable
LOWER: Not applicable

Unusual Fire and Explosion Hazards: Not applicable

Hazardous Combustion Products: Not considered flammable, however, finely divided powder in the form of a dust cloud can ignite if contacted by an ignition source.

SECTION V. REACTIVITY DATA

Stability: __X__ **Stable** _____ **Unstable**

Conditions to Avoid: Not applicable

Incompatibility (Materials to Avoid): Not applicable

Hazardous Polymerization: _____ **Will Occur** __X__ **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: __X__ **Inhalation** __X__ **Skin** __X__ **Ingestion**

Medical Conditions Aggravated by Exposure: Skin, and respiratory disorders and allergies.

Health Hazards (Acute and Chronic):

Inhalation:

Acute Exposure: Zirconium Oxide - A single intratracheal instillation to rats produced fibrogenic and proliferative changes and sclerosis in lung tissues. Yttrium Oxide - Inhalation of yttrium compounds has produced pulmonary irritation in animals.

Chronic Exposure: Zirconium Oxide - Inhalation exposure studies to zirconium oxide for 30 days, 60 days, and 1 year at 75 mg, 11 mg and 3.5 mg Zr/m^3, respectively, resulted in no detectable effects in animals. Industrial exposure to zirconium compounds has revealed no respiratory or other pathological problems. However, one study reported pulmonary granulomas in rabbits exposed to zirconium compounds. Yttrium Oxide – Inhalation has resulted in transient chemical pneumonitis, subacute bronchitis and bronchiolitis, focal hypertrophic emphysema and regional bronchiolar stricturing.

Skin Contact:

Acute Exposure: Zirconium Oxide - Application to abraded skin may cause allergic granuloma formation in previously exposed persons. Yttrium Oxide - Application to abraded skin may cause extensive injury resulting in epilation and scar formation.

Chronic Exposure: Zirconium Oxide - Repeated or prolonged contact to abraded skin may cause allergic granuloma, characterized by red-brown, firm, shiny, erythematous, nontender papules which generally disappear spontaneously, but slowly, persisting for months or years. No data available for yttrium oxide.

Eye Contact:

Acute Exposure: Zirconium Oxide - No available data. Yttrium Oxide – May irritate conjunctiva. When applied to denuded corneas, opacification has occurred after a latent period of several hours or days in animals.

Chronic Exposure: No available data.

Ingestion:

Acute Exposure: Zirconium Oxide - Gastrointestinal absorption is poor and therefore oral toxicity is low. Ingestion of small doses equivalent to 2, 4, 8, or 10 mg/kg resulted in no deaths in rats. Yttrium Oxide – Female rats tolerated oral doses at 1000 mg/kg.

Chronic Exposure: Zirconium Oxide - Repeated or prolonged ingestion of a diet containing 20 % by weight of a moist paste containing 20.9 % of zirconium oxide has produced no harmful effects in rats, or in kittens ingesting food containing 5 % of the compound. Yttrium Oxide – Animals fed for several months at levels up to 1 % in the diet, showed no histological, hematological or growth changes at the lower levels. However, nonspecific liver damage was seen with some of the compounds tested at 1 %.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration by qualified personnel if not breathing. Get immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion: If a large amount is swallowed, get immediate medical attention.

TARGET ORGAN(S) OF ATTACK: Not available

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released: Personnel should be protected against contact with this material. NIOSH approved dust respirator required.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Ventilation: Provide local exhaust ventilation system.

Handling and Storage: Protect against direct contact with this material. An eye wash station and washing facilities should be readily available near handling and use areas.

Gloves: Wear appropriate chemical resistant gloves.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Zirconium Oxide*, 19 March 2003, and MSDS *Yttrium Oxide*, 19 March 2003

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given on the NIST Certificate of Analysis.